

BIG-BANG NUCLEOSYNTHESIS AND THE ORIGIN AND EVOLUTION OF SPACE-TIME

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Primordial nucleosynthesis remains as one of the pillars of modern cosmology. It is the testing ground upon which all cosmological models must ultimately rest [1]. It is our only probe of the universe during the first few minutes of cosmic expansion and in particular during the important radiation-dominated epoch. There have been significant recent advances in the understanding of the big bang including the recent detection [2] of the inflation-generated gravity-wave background. This talk will review the current state of observational constraints on primordial abundances along with the key nuclear reactions, their uncertainties and how this knowledge places key constraints on cosmological models. In particular, we will summarize the connections between big bang nucleosynthesis and the birth of the universe [1], including cosmic gravity waves [3], inflation, the possible time variation of fundamental constants [4], the nature and origin of dark matter and dark energy, supersymmetry [5], and the primordial magnetic field [3].

[1] G. J. Mathews, et al. in *Proc. 12th International Workshop on Origin of Matter and Evolution of Galaxies (OMEG12)*, AIP Conf. Ser. In press (2014)

[2] BICEP2 COLLABORATION, *Astrophys. J* (2014) submitted.

[3] D. Yamazaki, et al. *Phys. Rep.*, 517, 141 (2012).

[4] M.-K. Cheoun, et al. *PRD*, 84, 043001 (2011).

[5] M. Kusakabe et al., *Astrophys. J Suppl.* (2014) submitted.